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PROTECTIVE ROLES OF EMBLICA OFFICINALAS (AMLA) IN DIABETES AND LIVER OF RAT.

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ABSTRACT -_ *Emblica officinalis* (Amla) are widely used in the Indian system of medicine and believed to increase defense against diseases. This article discuses and summarizes important medicinal values of *Emblica officinalis* (EO). In this communication, we reviewed the applications of EO in cancer, diabetis, liver treatment, heart disease, ulcer, anemia and various other diseases. Diabetes mellitus(DM), belongs to the class of metabolic diseases which the main symptom associated with this disease is the high sugar levels in blood for a long period. It can be categorized to the world's major disease considering that affects high population in earth and presents two main types I and II. Diabetes complications include possible blindness, amputation of lower limb, renal failure and cardiac arrest or stroke.This article focuses on the effect of Emblica Officinalis (EO) especially in lowering the level of diabetes and protection of liver. This article also focuses the retrospective studies on the Amla at molecular level.

Key words: Emblica officinalis. Diseases. Medicinal value. Formulation

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INTRODUCTION- *Emblica officinalis* (EO) enjoys a hallowed position in Ayurveda- an Indian indigenous system of medicine. According to believe in ancient Indian mythology, it is the first tree to be created in the universe. It belongs to family Euphorbiaceae. It is also named as Amla, *Phyllanthus Emblica or* Indian gooseberry. The fruits of EO are widely used in the Aryuveda and are believed to increase defense against diseases. It has its beneficial role in cancer, diabetis, liver treatment, heart trouble, ulcer, anemia and various other diseases. Similarly, it has application as antioxidant, immunomodulatory, antipyretic, analgesic, cytoprotective, antitussive and gastroprotective. Additionally, it is useful in memory enhancing, ophthalmic discorders and lowering cholesterol level. It is also helpful in neutralizing snake venom and as an antimicrobial. It is often used in the form of Triphla which is an herbal formulation containing fruits of EO, Terminalia chebula and Terminalia belerica in equal proportions.

IDENTIFICATION AND CHEMICAL CONSTITUENTS OF EO(EMBLICA OFFICINALIS):

Identification of correct genotype of medicinal plant material remained challenging to botanical durg industries. Limitations of chemical and morphological approaches for authentication have created need for newer methods in quality control of botanicals. DNA based maker for identification of EO were developed. Random Amplified Polymorphic DNA (RAPD) technique was used to identify a putative marker (1.1 kb) specific for EO.RAPD amplicon was used to generate Sequence Characterized Amplified Region (SCAR) marker. The SCAR marker was found beneficial for identification of *Emblica officinalis* in its commercial samples in Table 1 .

Table 1: General description of EO(Emblica officinalis)

S.No	1. Habitat
1.	Found in India, Pakistan, Uzbekistan, Srilanka, South East Asia, China and Malaysia
	2. Used Parts
1.	Dried fruits, Fresh fruit, seed, leaves, rootbark, flowers
	3. Fruits
1.	Ripen from November to February
2.	Nearly spherical or globular, wider than long and with a small and slight conic depression on both apexes
3.	Fruit is 18-25mm wide and 15-20mm long
4.	Surface is smooth with 6 obscure vertical pointed furrow
5.	Mesocarp is yellow and endocarp is yellowish brown in ripened condition
6.	In fresh fruit mesocarp is acidulous and in dried fruit it is acidulous astringent.
	4. Leaves
1.	Leaf is 8-10 mm or more long and 2-3 m broad, hairless light green outside, palegreen or often pubescent beneath.
2.	It contains gallic acid, ellagic acid, chebulic acid, chebulinic acid, chebulagic acid, a gallantonic called amlic acid, alkaloids phyllantidine. and phyllantine.
	5. Seeds
1.	Four-Six, smooth, dark brown
2.	A fixed oil, phosphatides and a small quantity of essential oil. The fixed oil (yield 16% and has the following physical and chemical characterstics: acid value12.7; saponification value

185;iodine value 139.5;acetyl value 2.03; unsaponifiable matter 3.81%; sterol 2.70% ; saturated fatty acid 7%. Contains linolenic acid (8.78 %), linoleic (44%). oleic (28.40%), steric (2.15%), palmitic (2.99%) and miristic acid (0.95%).

	6. Barks
1.	Thick to 12 mm, shining grayish brown or grayish green.
2.	Leukodelphinidin, tannin and proanthocyanidin
	7. Roots
1.	Ellagic acid and lupeol

Emblica officinalis primarily contains tannins, alkaloids, phenolic compounds, amino acids and carbohydrates. Its fruit juice contains the highest vitamin C (478.56 mg/100 mL). The fruit when blended with other fruits, boosted their nutritional quality in terms of vitamin C content.

Compounds isolated from *Emblica officinalis* were gallic acid, ellagic acid, 1-O-galloyl-beta-D-glucose, 3,6-di-O-galloyl-D- glucose, chebulinic acid, quercetin, chebulagic acid, corilagin, 1,6-di-O - galloyl beta D glucose, 3 Ethylgallic acid (3 ethoxy 4,5 dihydroxy benzoic acid) and isostrictiniin . Phyllanthus emblica also contains flavonoids, kaempferol 3 O alpha L (6'' methyl) rhamnopyranoside and kaempferol 3 O alpha L (6''ethyl) rhamnopyranoside . A new acylated apigenin glucoside (apigenin 7 O (6'' butyryl beta glucopyranoside) was isolated from the methanolic extract of the leaves of *Phyllanthus emblica* together with the known compounds; gallic acid, methyl gallate, 1,2,3,4,6-penta-O-galloylglucose and luteolin-4'-O-neohesperiodoside were also reported . A number of compounds found in EO(*Emblica officinalis)* are listed in Table 2 and 3.

Table 2 : Chemical constituents found in EO(*Emblica officinalis)*

S.No	Chemical Constituents
1.	Tanins
2.	Alkalods
3.	Phenolic compounds
4.	Amino acids
5.	Carbohydrates
6.	Vitamin C
7.	Flavanoid

8.	Ellagic acid
9.	Chebulinic acid
10.	Quercetin
11.	Chebulagic acid
12.	Emblicanin-A
13.	Gallic acid
14.	Emblicanin-B
15.	Punigluconin
16.	Pedunculagin
17.	Citric acid
18.	Ellagotannin
19.	Trigallayl glucose
20.	Pectin

Table 3 : Average percentage composition of the fruit pulp of *Emblica officinalis*

S.No	Components	Percentage
1.	Moisture	81.2%
2.	Protein	0.5%
3.	Fat	0.1%
4.	Mineral matter	0.7%
5.	Fibre	3.4%
6.	Carbohydrate	14.1%
7.	Calcium	0.05%
8.	Phosphorous	0.02%
9.	Iron	1,2mg/100gm
10.	Nicotinic acid	0.2mg/100gm
11.	Vitamin C	600 mg/100 gm

Uses of EO(*Emblica Officinalis)* in Diabetis:

Oral administration of the extracts (100 mg/kg body weight) reduced the blood sugar level in normal and in alloxan (120 mg/kg) diabetic rats significantly within 4 hours. EO(*Emblica officinalis)* and an enriched fraction of its tannoids are effective in delaying development of diabetic cataract in rats .

Aldose reductase (AR) has its involvement in the development of secondary complications of diabetes including cataract. EO(*Emblica officinalis)* is proved as an important inhibitor of AR. Exploring the therapeutic value of natural ingredients that people can incorporate into everyday life may be an effective approach in the management of diabetic complications .

Effects of EO(*Emblica Officinalis)* on Liver:

EO(*Emblica officinalis)* fruits have been reported to be used for hepatoprotection in Ayurveda . *Phyllanthus emblica* extract was investigated on ethanol induced rat hepatic injury. Protective roles of this against ethanol induced liver injury in rats are reported . A hydroalcoholic (50%) extract of fruit of EO (EO-50) decreased the severity of hepatic fibrosis induced by thioacetamide and carbon tetrachloride. EO-50 effectively reversed profibrogenic events possibly due to its antioxidative activity. Hepatoprotective effect of EO-50 against antituberculosis (anti-TB) drugs-induced hepatic injury has been reported. EO-50 exhibits hepatoprotective activity due to its membrane stabilizing, antioxidative and CYP 2E1 inhibitory roles . EO also inhibited hepatic toxicity in Wistar rats . The extract of EO and Chyavanaprash were investigated for its hepatoprotective activity using carbon tetrachloride (CCl4) induced liver injury in rats.Both extracts were observed to inhibit the hepatotoxicity produced by acute and chronic CCl4 administration as seen from the decreased levels of serum and liver lipid peroxides (LPO), glutamate-pyruvate transaminase (GPT) and alkaline phosphatase (ALP). Chronic CCl4 administration was also found to produce liver fibrosis as seen from the increased levels of collagen-hydroxyproline and pathological analysis. Both extracts were found to inhibit these elevated levels significantly, showing that the extract could reduce the induction of fibrosis in rats model.

Applications of EO (*Emblica Officinalis)* in Curing of Other Diseases:

Triphala containing one of the ingredients as EO(*Emblica officinalis)* is used to treat diseases such as anemia, fever, chronic ulcers, constipation, jaundice and asthma. Polyphenolic fractions isolated from Triphala exhibit anti-mutagenic effect. Active principles of Triphala was further evaluated and used as an excellent therapeutic formulation for infected wounds . Aqueous plant extract was tested on Swiss albino mice for its radioprotective properties against sublethal gamma radiation (9 Gy). Most effective dose of fruit pulp extract was found to be 100 mg/kg body weight against radiation. This dose elevated the survival time

and lowered the mortality rate of mice significantly. Furthermore, body weight loss in extract administered irradiated animals was significantly less in comparison with animals who were given radiation only . Various formulations of EO(*Emblica officinalis)* used for curing different diseases.

Flavonoids derived from EO(*Emblica officinalis)* exibit maximum beneficial action by eliciting highly potent hypolipidaemic and hypoglycaemic activities. In addition to this, flavonoids were found to be effective in elevating the haemoglobin levels in rats . It is also reported to be as antitumor .

EO (fruit) has been evaluated against thioacetamide (TAA) and CCl4 induced changes in rat liver. Treatment with TAA and CCl4 produced abnormal histopathology indicative of pre-fibrogenic events. EO reversed such alterations with significant regenerative changes indicating its preventive role in prefibrogenesis of liver . Extract of *Withania. somnifera* root, but not EO fruit, caused a reproducible, dose dependent, inhibition of colony formation of CHO cells . Hypercholestermia is one of the factors that create coronary artery disease. Triphala formulation exhibit hypolipidemic effects on the experimentally induced hypercholesteremic rats were reported.

CONCLUSION

Research in medicinal plants has gained a renewed focus recently. The prime reason is that other system of medicine although effective come with a number of side effects that often lead to serious complications. Plant based system of medicine being natural does not pose this serious problems. Though *Emblica officinalis* has various medicinal applications, but it is the need of hour to explore its medicinal values at molecular level with help of various biotechnological tools and techniques. Further studies should be conducted to elucidate the molecular mechanism of interaction of various plant based drugs with human body in different diseases.

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